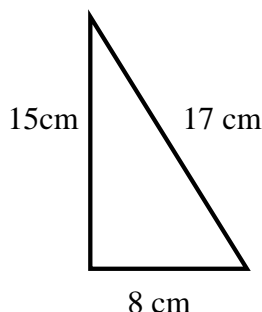


## National 5

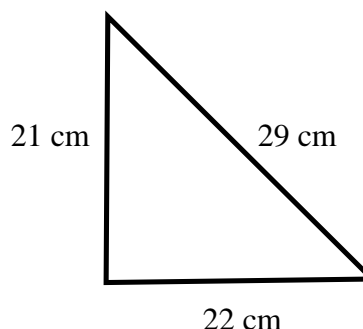
### Homework RE12

1. Use the converse of Pythagoras' Theorem to determine whether either of these triangles is right-angled:

(a)



(b)



2. A biology department keeps in its storeroom two types of glucose solution, one weak and the other strong.

The weak solution contains 8 grams of glucose per litre of water.

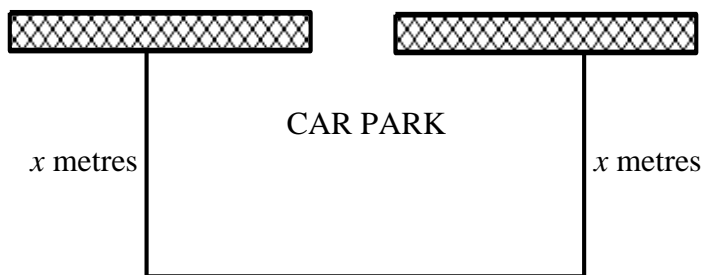
The strong solution contains 18 grams of glucose per litre of water.

The science technician is asked to prepare 4 litres of a new glucose solution which contains 15 grams of glucose per litre of water.

In order to make the new solution, he mixes  $x$  litres of the weak solution with  $y$  litres of the strong solution.

- (a) Write down two equations in  $x$  and  $y$  which describe this situation.  
(b) Calculate the volume of weak solution and the volume of strong solution which he must mix together to prepare the new solution.

3. A temporary rectangular car park is made by using an existing straight wall and 420 metres of fencing. The entrance to the park is contained within the stretch of wall.



- (a) If  $x$  metres is the breadth of the car park, show that the area  $A$ , in sq metres, enclosed by the car park, is given by the formula  $A = 420x - x^2$ .  
(b) Find the dimensions of the car park for a maximum area, explaining your answer.
4. (a) Sketch the graph of  $f(x) = 15 - 2x - x^2$ .  
(b) Hence solve the inequality  $15 - 2x - x^2 < 0$ .
5. (a) Express  $\sqrt{32} + \sqrt{50} - \sqrt{2}$  as a surd in its simplest form.  
(b) Simplify  $a^3 a^{-5} + 2$ .  
(c) Multiply and collect like terms  $x - 4x^2 + 5x - 3$ .

6. (a) Express as a single fraction  $\frac{1}{2x-3} - \frac{1}{x}$ ,  $x \neq 0, \frac{3}{2}$ .

(b) Simplify  $\frac{1-4x^2}{7-14x}$ ,  $x \neq \frac{1}{2}$ .

7. The tank of a car contains 5 litres of diesel.  
A further 45 litres of diesel is pumped in at a steady rate for 60 seconds.

(a) Draw a graph of the volume  $V$  litres against the time  $t$  seconds.

(b) Find an equation for the graph you have drawn.

8. Traffic authorities are investigating the number of cars travelling along a busy stretch of road.  
They assume all cars are travelling at a speed of  $v$  metres per second.  
The number of cars,  $N$ , which pass a particular point on the road in one minute is given by the formula  $N = \frac{30v}{2+v}$ .

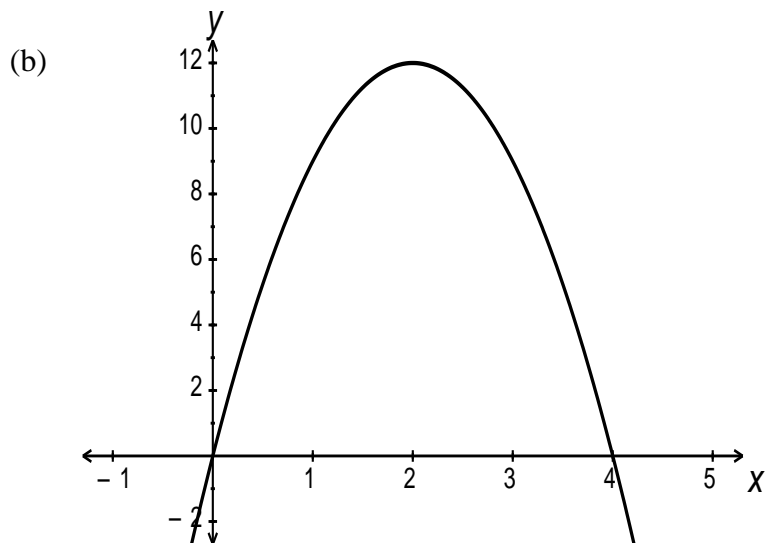
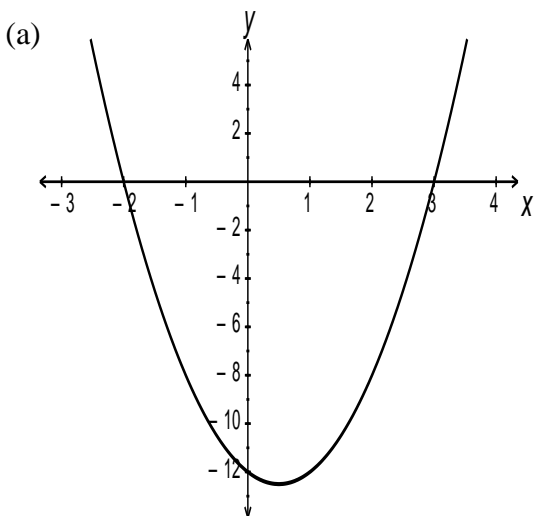
In one minute, 26 cars pass a point on the road.

Find the speed of the cars in metres per second.

9. Establish the equation of each of these parabolas.

In part (a) write the equation in the form  $y = kx^2 + a$  or  $y = k(x-a)^2 + b$ .

In part (b) write the equation in the form  $y = kx^2 + px + q$ .



10. AB has length 12cm. PQ has length 5cm. Find the length of the radius of the circle.

